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June 6, 2019

VIA ELECTRONIC FILING

The Honorable Jocelyn G. Boyd
Chief Clerk/Administrator
Public Service Commission of South Carolina
101 Executive Center Drive, Suite 100
Columbia, SC 29210

RE: Petition of Duke Energy Carolinas, LLC and Duke Energy Progress, LLC for Approval of CPRE Queue Number Proposal, Limited Waiver of Generator Interconnection Procedures, and Request for Expedited Review Docket No. 2018-202-E

Dear Ms. Boyd:

Pursuant to the Public Service Commission of South Carolina's ("Commission") Order No. 2019-247 issued on April 9, 2019, in the above-captioned docket, Duke Energy Carolinas, LLC ("DEC") and Duke Energy Progress, LLC ("DEP") (collectively, the "Companies" or "Duke") hereby respectfully provide the Commission an update on the Companies' most recent Distributed Energy Resources ("DER") Technical Standards Review Group ("TSRG") meeting held on May 7, 2019.

The TSRG was established in early 2018 as a forum for Duke Energy engineers, technical personnel from the Office of Regulatory Staff ("ORS") and the North Carolina Utilities Commission—Public Staff, and engineers representing the DER industry to discuss Duke's generator interconnection technical policies, as well as technological engineering developments in DER interconnection. As Duke is solely accountable and responsible for maintaining adequate customer reliability and power quality on the DEC and DEP systems, the TSRG is not a decision making venue. Instead, the goal of the TSRG is to provide an ongoing technical discussion forum and to foster greater transparency and improved understanding of the Companies' evolving interconnection standards and technical requirements. Since the TSRG's initial formation, Duke has held five general meetings per the intended quarterly meeting frequency. Discussions have focused on new interconnection-related developments and potential revisions to the Companies' existing technical standards. The most recent TSRG meeting was held on May 7, 2019 and the next TSRG meeting is planned to be held in September**,** 2019. The TSRG has been successful in increasing communications between the Companies and Interconnection Customers, and in providing an efficient forum for DER industry engineers to ask and receive clarifications on the Companies' current technical procedures.

The following attachments enclosed with this update provide a more detailed account of the previous TSRG meeting and issues discussed:

- **Attachment A:** May 7, 2019 Draft Meeting Minutes
- **Attachment B:** Advanced Energy Interconnection Commission Update Presentation
- **Attachment C:** Small DG Interface Telemetry & Control Interface Presentation
- **Attachment D:** Selecting Voltages for the System Impact Study Presentation

To further promote transparency and technical understanding, Duke has also established a TSRG webpage, https://www.duke-energy.com/business/products/renewables/generate-your-own/tsrg, which is publicly-accessible on the Duke Energy website. The meeting materials provided from each prior TSRG meeting, as well as other technical standards documents, are also posted on the TSRG webpage, with the exception of Attachments A-D of this update, which are currently in the process of being uploaded to the webpage.

Should you have any questions regarding this matter, please do not hesitate to contact me at 803.988.7130.

Sincerely,

Rebecca J. Dulin

Attachments

cc: Parties of Record

Duke Energy Carolinas/Progress Interconnection Technical Standards Review Group (TSRG)

Meeting Minutes

May 7, 2019

I. Opening

This is a regular meeting called to order at 9:17 AM in Raleigh, NC

Meeting facilitator: Anthony Williams

Minutes: Anthony Williams

II. Record of Attendance

Member Attendance

Name	Affiliation	Attendance
Kevin Chen	Duke Energy	present
Jeff Daugherty	Duke Energy	absent
Wes Davis	Duke Energy	present
Jonathan DeMay	Duke Energy	present
John Gajda	Duke Energy	present
Huimin Li	Duke Energy	present
Orvane Piper	Duke Energy	present
Bill Quaintance	Duke Energy	present
Scott Reynolds	Duke Energy	absent
Jonathon Rhyne	Duke Energy	present
Jim Umbdenstock	Duke Energy	absent
Anthony Williams	Duke Energy	present
Stephen Barkaszi	Duke Energy	phone
Paul Brucke	NCSEA	present
Jon Burke	GreenGo Energy	present
Gabe Cantor	Strata Solar	absent
Drew Chandler	Yes Solar Solutions	absent
Jason Epstein	Southern Current	absent
Chuck Ladd	Ecoplexus	present
Bruce Magruder	Keytech Engineering	absent
Bruce Fowler	Keytech Engineering	present
Sean Grier	Duke Energy	absent
Scott Griffith	Duke Energy	present
Luke O'Dea	Cypress	present
Nwene Ogwu	Strata Solar	present
Luke Rogers	Birdseye Renewable Energy	absent
Chris Sandifer	SCSBA	present
Reigh Walling	NCCEBA	absent
Jay Lucas	NC Public Staff	absent
James McLawhorn	NC Public Staff	absent

Name	Affiliation	Attendance
Dustin Metz	NC Public Staff	phone
Tommy Williamson	NC Public Staff	present
Dawn Hipp	SC Office of Regulatory Staff	absent
Sarah Johnson	SC Office of Regulatory Staff	absent
Robert Lawyer	SC Office of Regulatory Staff	phone

Guest Attendance

Name	Affiliation	Attendance
Cyrus Dastur	Advanced Energy	present

III. Current agenda items and discussion

1) The published agenda was emailed out.
2) January action items – Anthony Williams, Duke
   A) There were several action items from January. Two are discussed here and the remainder are covered as part of the May agenda items.
   B) Action item response: Attempt to reconstruct the original basis for the voltage fluctuation limit of 3% in the FCR
      (i) Duke noted at the last TSRG meeting the 3% limit has been in place at least a decade. Originally, the limit was 2% for transmission only and then was later increased to 3% and included distribution.
      (ii) The reasoning back then, is the same as we have communicated for the present. The 3% is based on experience from actual events and considers that not every operating condition and customer sensitivity can be precisely anticipated and studied in advance.
   C) Action item response: Provide an overview of the distribution planning process
      (i) Duke has found that items with a general scope like this are usually too broad to address effectively at TSRG. Duke prefers to focus on a specific issue that the industry prioritizes, like the voltage selection topic on the agenda later.

3) PRESENTATION: Commissioning update – Cyrus Dastur, Advanced Energy
   A) Presentation provided with minutes
   B) Industry question – will there be a summary of all issues? Typically, each developer will only be aware of issues that arise for their sites.
      (i) Duke Response – Yes, the upcoming training should address concerns across all sites
      (ii) Training: McKimmon Center, June 11, 2019 and June 20, 2019, 1:00pm - 4:30pm
   C) Industry comment - some of the new devices don't seem to have a standard yet.

(i) Duke Response - upcoming improvements in the reference guide should address some of these issues.

D) Industry question – will there be commissioning for transmission sites? Will it be in 2019?
   (i) Duke Response – Yes, in the future, but not now. There is an internal review going on to develop the transmission commissioning. This may conclude by the end of the year, so it seems more likely that this process would not be in place for 2019.

E) Industry comment – Would the MV side of a transmission interconnection be subject to current distribution-level of commissioning?
   (i) Duke Response – That has not been decided yet.

4) PRESENTATION: Small DER Interface Update - Jonathon, Duke
   A) Presentation provided with minutes
   B) Industry question – what does 50% setpoint mean in terms of active power
      (i) Duke Response – 50% of inverter nameplate
   C) Industry question – on the figure 75D – what does "use of the enable/ disable control function is intended for atypical system operating situations "mean
      (i) Duke Response – This term has been here a very long time and has nothing to do with the DG interface changes. The main situations this represents are system emergencies and unusual operating conditions such as temporary switching and reconfiguration. It most closely aligns with the 1547 "Permit Service" functionality.
   D) Industry question – what are the response time requirements
      (i) Duke Response – Currently using the 2 second time from IEEE 1547 as the expected time for the DER to cease to energize when the permissive signal is removed
   E) Industry question – Will the small DG interface be expanded to sites above 1 MW?
      (i) Duke Response – it will be considered, if the deployments go well and it proves to be an effective way to manage the more advanced inverter features.
   F) Industry question – trans sites use dnp vs modbus
      (i) Duke Response – this interface is not for trans. trans SCADA design is already in place.

5) DTT Update—Anthony Williams, Duke
   A) Action item response: Provide information from the EPRI DTT surveys
      (i) EPRI Report
         (a) The EPRI report is not public nor complete. So, only some general observations can be provided.
         (b) 37 utility surveys and about a dozen additional document reviews were performed for the survey
         (c) There is no consensus screening practice: no DTT, DTT % penetration, DTT kW size, and both % & kW
         (d) load to generation ratio is a very common screening criteria

(e) Comms: third party and leased lines; viewed least reliable, fiber viewed as most reliable,
(i) issues noted with powerline carrier, radio, and wireless.
(ii) Radio and wireless were lumped together, but those along with fiber are most common
(f) approx. 40% of utilities are currently reviewing DTT policies. EPRI feels that value is growing.

(ii) Duke - With so many evaluating their current policies, this survey could turn out to be more of a snapshot. Because there is a lot of review happening, there is the potentially for significant changes.

B) Action item response: Communicate bases for DTT on dedicated feeders to a distribution station
(i) DTT is not required for distribution DER interconnections that have a dedicated feeder from the substation. When there is a need to isolate the generator, it is tripped at the dedicated circuit breaker. A review of the interconnection requests showed a few interconnections that specified a dedicated feeder, but none with DTT required.

C) Action item response: Verify if 900 MHz radio is acceptable for DTT
(i) this communication option is considered as part of the enterprise-wide DTT policy review.
(ii) There have been implementations of 900 MHz radio systems at various times on the Duke system. The Duke experience, and that of some co-ops, is these systems do not have high reliability and are susceptible to a variety of issues.
(iii) Terrain and vegetation are two of the most common. These factors can significantly decrease the reliability and increase the preliminary cost estimate of a radio system.
(iv) However, to design and install a system that functions well over time and meets utility communication requirements, the cost is often higher than the initial estimates. For example, higher and/or more towers.
(v) Nevertheless, this communication option is considered as part of the enterprise-wide DTT policy review.

D) Action item response: Provide information from the EPRI DTT surveys

E) General Enterprise Protection Team update (DTT)
(i) Commonly asked questions were reviewed.
(ii) What is Duke doing in the way of benchmarking
(a) Duke is considering practices at other utilities. Duke is participating in EPRI research projects, having discussion with neighboring utilities as well as others in the country, and collecting and reviewing many public utility documents. All methods of discovery provide input to the evaluation. Other utilities are considering changing their practices, which makes benchmarking harder.
(iii) Is Duke considering more options than fiber
(a) Duke is considering multiple potential solutions and evaluating based on system protection requirements, industry standards, research projects, Duke experience, and industry experience.

(iv) When will the evaluation be complete

(a) Duke is conducting a comprehensive review of this topic at an enterprise level. It must be at this level because one of the key goals is to unify practices across DEP and DEC. Resources are specifically dedicated to this project. TSRG discussions and needs played a definite role in elevating the priority. The target remains the same: late 2019 to obtain enterprise agreement on key decisions for standard practices. Then, documentation and change management plans will be developed following these decisions.

F) Industry question – DEC allows third party networks on transmission. Can Duke give more latitude to do this on Distribution if it is an option for Transmission?

(i) Duke Response – It is thought that leased fiber is an option for Transmission, but it is also known for poor reliability.

(a) **ACTION ITEM** – Duke will ask protection if leased fiber is an option that is not currently communicated.

G) Industry question – What is required for DTT at the substation level versus the feeder level? Possibly 3V0 is part of this for Massachusetts and New York.

(i) Duke Response – We do not have the details about station-level equipment for DTT.

(a) **ACTION ITEM** – Duke will provide a description of what is done for station-level DTT.

H) Industry question – Is Duke considering reclose blocking on the feeder and other [non-DTT] protection options?

(i) Duke Response – yes, reclose blocking on the feeder is done now (for DEC) and the enterprise review effort is considering other protection options too

6) Overview of the FT and SR process review – Wes Davis, Duke

Duke is working with EPRI to review the fast track and supplemental review processes. In a benchmarking effort, EPRI will look at the total interconnection process from the pre-application all the way through to the study and interconnection agreement. As a stipulation with the NC Public staff, EPRI will also specifically review the FT and SR processes.

A) Industry question – how does this tie with cluster studies and stakeholder process?

(i) Duke Response – a cluster process may be a way to spread the costs among many interconnectors. Duke is evaluating alternatives (queue reform) to the existing process. The EPRI review and queue reform are not directly tied together.

B) Industry question – does Duke foresee another interconnection docket coming after the current docket

(i) Duke Response – if the EPRI study makes recommendations, then Duke may consider additional stipulations to the existing docket. Any change would be by staff approval. Otherwise another docket would likely be required.

C) Industry question – Scope on EPRI review. Is it technical or process focused?

(i) Duke Response – EPRI is independent and setting much of the agenda. The stipulation with the NC Public staff focuses on FT and SR.

7) SIS Historical Voltage Discussion – Jonathan DeMay, Duke

This topic was presented in the last meeting. More description on how the historical voltages are selected by the tools and software was requested.

A) Industry question – how does time factor into the selection of the voltage
   (i) Duke Response – for DEP: When DSDR is engaged the system reduces voltages rapidly enough that it appears as a step-change when the data is graphed. For the Peak Loading Study, if the peak load occurs during a DSDR event, the pre-DSDR voltage (just before the step-change) is used for the peak study. For the SIS peak/valley demand cases Duke uses a voltage that occurs within a +/- 2 week window of the peak/valley demands.
      (a) There are restrictions to what voltage can be used within the window:
         (i) The load value must be within 10% of the reference demand value
         (ii) The voltage must be 0.4 volts greater than the reference demand voltage
         (iii) If these two conditions are met, then subtract 0.4 volts from this higher voltage. This new model voltage is called the alternative voltage (also see the response E below).
   (ii) For DEC, the voltage coincident with load is used.

B) Industry question – How did Duke get to the 2 week plus or minus?
   (i) Duke Response – This window incorporates that the voltage can move within a range, bounded by the voltage regulating device control. There is randomness introduced by the controls because the capacitor and regulators have a 'do nothing' deadband between the two setpoints that cause controller operation. This window is a method to look for times with similar load that may have a slightly different voltage.

C) Industry question –How is the voltage selection benchmarked?
   (i) Duke Response – This method aligns with how planning is done. Planning traditionally uses bounding conditions. Just because a specific operating state is not included in the data does not mean that operating point or combination never existed or cannot exist. The operational points represented by the data are just the ones that happen to be recorded based on the frequency data capture.

D) Industry – Suggest modeling the feeder regulator in hope that it would adjust voltage and account for station voltages
   (i) Duke Response – That may be an option. Then may need to consider the target voltage plus half the bandwidth, which could be a higher voltage than the voltage chosen now. It may be that in some cases the feeder regulator could reach max raise or lower and lose ability to regulate.

E) Industry question – Explain the 0.4 V adjustment more
   (i) Duke Response – within the two week window, find other similar load values; filter out anything 0-0.4 V; then left with those voltages greater than 0.4 V over the reference demand voltage. Choose the higher voltage and then subtract the 0.4 V.

8) Smart inverter volt-VAR control – Luke O'Dea

Several of the available inverter functions were mentioned:

- Adjustable pf
- Volt var mode
- Volt watt
- Fixed reactive power
- Frequency watt

Industry noted

- CA rule 21 includes most of these in a phased in approach
- ISO NE – coordinating the ride-through settings
- Illinois – implementing volt var control

Some utilities are adopting or have adopted some of these.

Industry recommends looking at ride-through settings. Others have required that all inverters have the same ride-through setting for residential systems. HECO communicates with the residential inverters via internet.

Duke expects transmission to initiate the ride-through discussion. Then they will take it to the distribution entities, Duke and non-Duke.

Some utilities require UL1741SA; the industry thinks most manufacturers can comply to this with existing equipment.

Industry would like Duke to look at what can be done now with volt-var without getting into issues with DSDR.

Volt-watt as discussed. Duke asked how it would be studied and how the developers would like to study it. Use of this function will reduce output and therefore energy delivered from the site. This complicates the study and return for the investment. Industry noted some utilities are already using volt-watt as a primary or as a backup to the volt-var function.

The industry is more concerned with inverter level functions and control and sees wider area control more as a future capability. Duke noted that it is concerned with issues at the station, feeder, and site level, which may or may not be as easy to plan for and control as at the inverter level.

9) Method of Service Guideline (MOSG) Discussion – Luke O'Dea

Industry members presented and discussed some concerns with MOSG topics

The industry noted that circuit stiffness may not need to be a criterion now that the inrush studies are performed.

The industry indicated that other utilities are using/building dedicated circuits to the unregulated bus for DER interconnections. Some of these are NY, MA, TN.

10) Date for next meeting and location
    A) Next meeting planned for Raleigh.
    B) September 17th was discussed in the meeting as well as the 24th. The 17th was chosen, but needed to move to the 24th to coordinate all scheduling.

IV. Closing

This meeting concluded at 3:15 PM

V. Attachments

1) Agenda, "TSRG Agenda 2019_0507, Rev 1.pdf"
2) Presentations
    A) Interconnection Commissioning Update, "TSRG Advanced Energy Presentation May 2019.pdf"
    B) Small DG Interface, Telemetry and Control, "Small DG Interface.pdf"
    C) Voltage and Load Selection, "Selecting Voltages for the SIS.pdf"
3) References
    A) None

Interconnection Commissioning Update

Cyrus Dastur, Advanced Energy

advanced energy

2018 Review

General Observations - 2018

- Sites were better prepared for inspection in 2018 than in 2017.
- Field staff knowledge continues to strengthen, but can be undermined by lack of communication and/or expertise of office staff.
- A high volume of commissioning tests were successfully scheduled in a short period of time, but the number of failures increased.
- Internal developer QA is very constructive.

2018 Volume

- 60 sites commissioned in 2018
  - 31 sites full commissioning
  - 29 sites conditional commissioning
- 84 site visits in Q1-Q3
- 94 site visits in Q4

Success Rate

Less than 50% of sites complete the commissioning process with only 1 inspection and 1 test

Shortest report- 6 pages (2.5 weeks to complete entire commissioning process)

Longest report- 74 pages (TBD time to complete entire commissioning process)

2018 Q4 Results

- Every site that had construction complete before December 7 had an interconnection inspection
- Every site that was ready for a commissioning test by December 31 attempted at least one test
- 10 re-inspections in Q4
- 10 failed tests in Q4 (11 failed tests Q1-Q3)
- 8 re-tests in December

Common Problems

Common inspection deficiencies:

- Grounding
- Ground-fault detection systems
- Riser construction

Common reasons for failed tests:

- Recloser programming
- Transformer delay switch operation
- Inverter operation

2019 Updates

Process Updates - Inspection

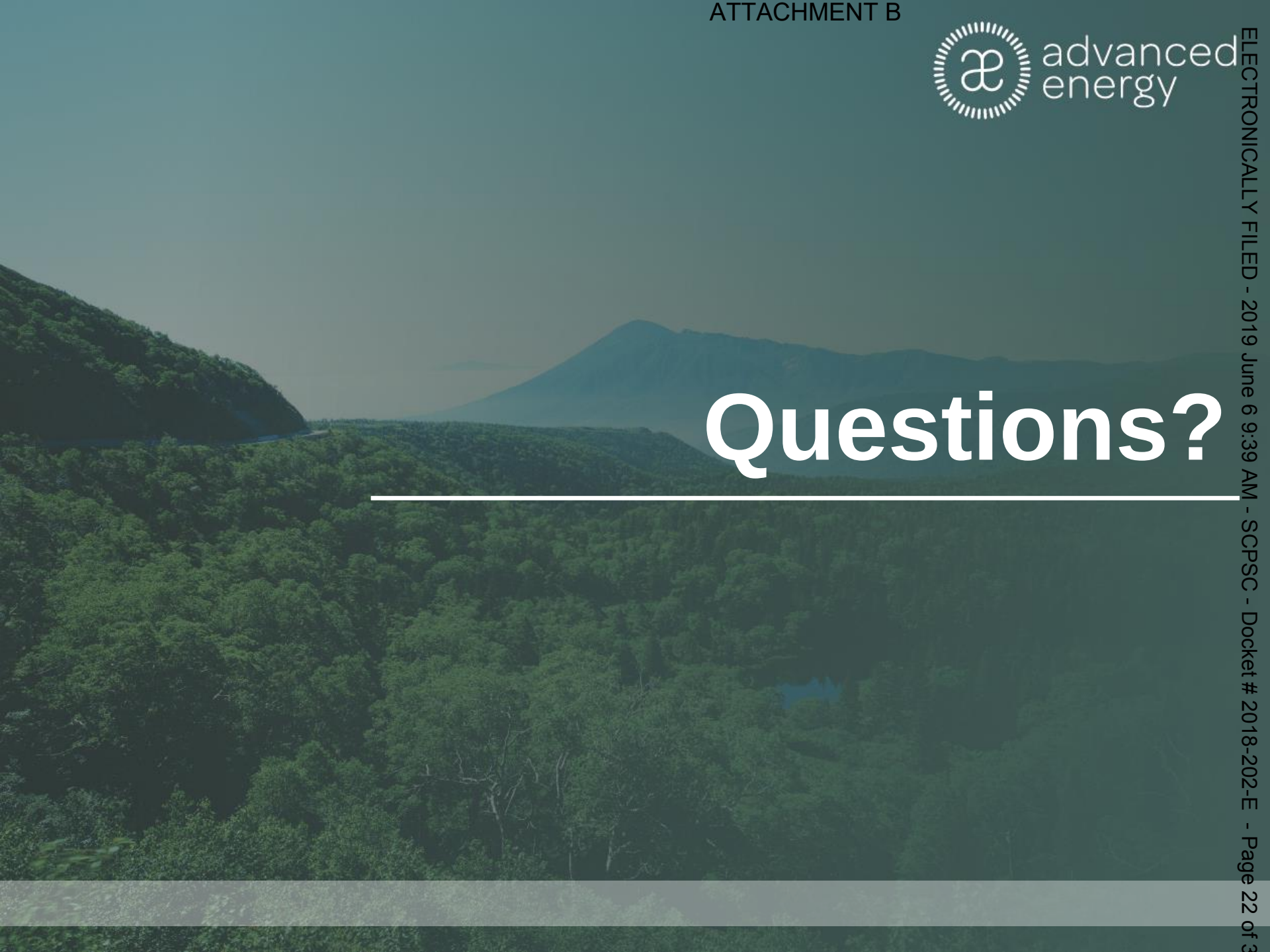
- Highly recommend customers wait to have site inspection until Duke Energy has marked phasing and customer OH matches it.
- Security fence must be complete for safe-to-energize status to be given.
- Maintained access road to the Duke Energy meter and recloser poles must be complete for safe-to-energize status to be given.

Process Updates - Commissioning Test

- Weather conditions must permit the site to generate at least 20 percent of the site's full rated AC current in order to conduct the commissioning test.
- The PV array construction must be complete.
- AE will note the as-built make/model and number of PV modules (used to calculate the site's DC:AC ratio)

Upcoming Training

- Duke Energy construction reference guide to be published soon.
- Two technical training sessions
  - June 11
  - June 20



Small DG Interface

Telemetry & Control interface

Jonathon Rhyne

DER Technical Standards

Distributed Energy Technologies Department

DUKE ENERGY

Why/What is the Small DG Interface?

Reason:

Net metered customers* have masked loads. Actual Load – PV Generation = Masked Load. Duke Energy's SCADA system does NOT account for this PV generation when operators are doing switch operations. As more and more NM solar comes online this becomes a problem.

*Applies to customers ≥ 250kW and < 1MW.

Equipment:

- SEL-3505 Real Time Automation Controller (RTAC)
- Sierra Wireless GX450 Cellular Modem

Purpose:

- Provide Duke Energy SCADA with telemetry and control of inverter based generation.
- Communications based equipment that is not electrically connected to the DER site.

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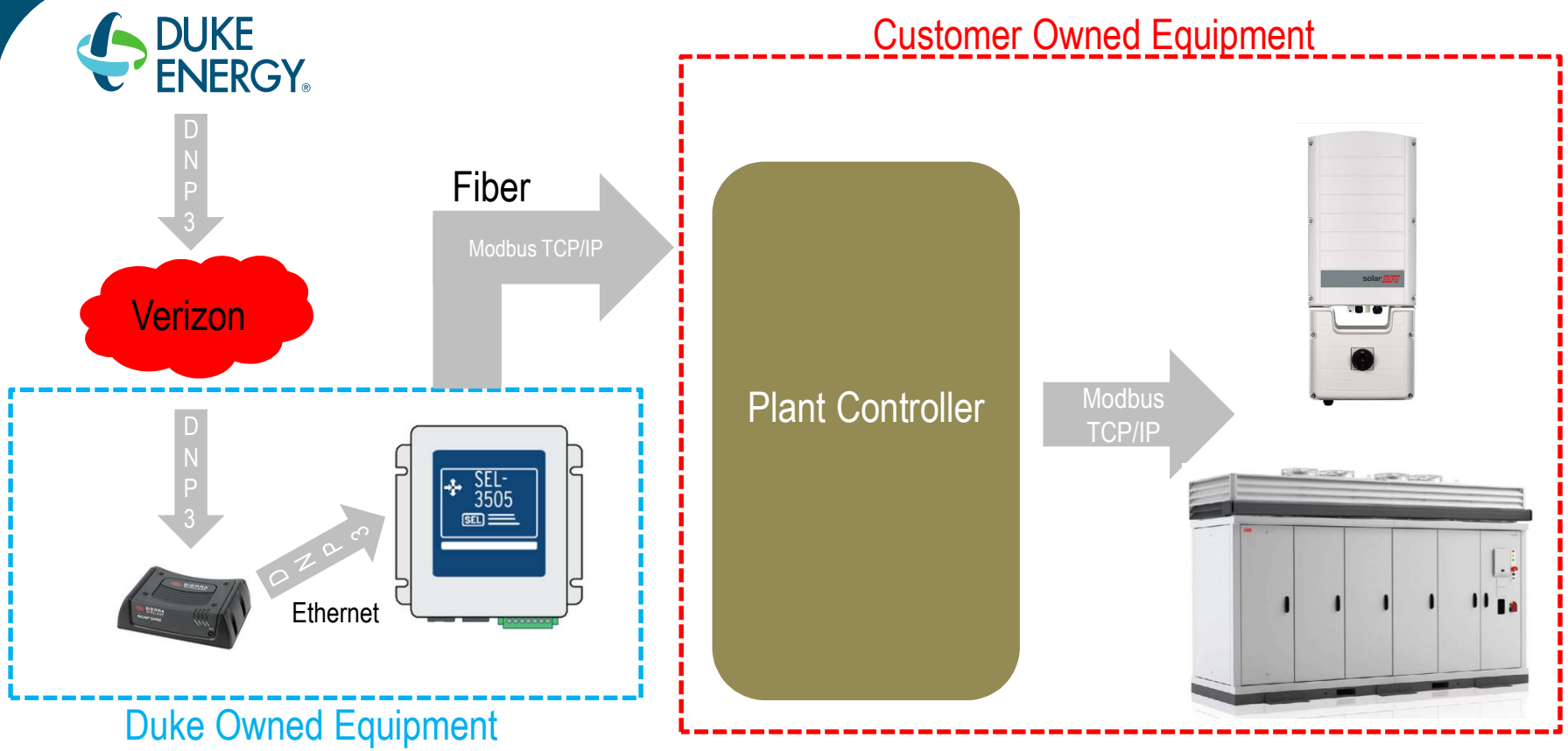
Small DG Overview



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Duke's Modbus Map

Telemetry

Address	Point	R/W	Description
40000	ID	R	ID
40001	L	R	Length
40002	Amps	R	Total Amps
40003	Amps_A	R	Phase A Amps
40004	Amps_B	R	Phase B Amps
40005	Amps_C	R	Phase C Amps
40006	Amps_SF	R	Amps Scale Factor
40007	Volt_AB	R	Line AB Voltage
40008	Volt_BC	R	Line BC Voltage
40009	Volt_CA	R	Line CA Voltage
40010	Volt_AN	R	Phase AN Voltage
40011	Volt_BN	R	Phase BN Voltage
40012	Volt_CN	R	Phase CN Voltage
40013	Volt_SF	R	Voltage Scale Factor
40014	P	R	Real Power
40015	P_SF	R	Real Power Scale Factor
40016	H	R	Frequency
40017	H_SF	R	Frequency Scale Factor
40018	S	R	Volt-Amperes
40019	S_SF	R	Volt-Amperes Scale Factor
40020	Q	R	Reactive Power
40021	Q_SF	R	Reactive Power Scale Factor
40022	3PF	R	Three Phase Power Factor
40023	PF_SF	R	Power Factor Scale Factor
40024	Cap_Rtg	R	Capacity Rating in MW

Controls

Address	Point	R/W	Description
40025	Enable	R/W	Connected/Disconnected
40026	P_Set	R/W	Real Power Set Point
40027	P_Set_SF	R	Real Power Set Point Scale Factor
40028	Q_Set	R/W	Reactive Power Set Point
40029	Q_Set_SF	R	Reactive Power Set Point Scale Factor

Point	Example
Enable	Connection Control. Is inverter contact/breaker open(0) or closed(1).
P_Set	Set real power output to specified level (0-100%).
P_Set_SF	
Q_Set	Set reactive power output to specified level (0-100%).
Q_Set_SF	

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SunSpec Information Model 101

Name	Label	R/W	Mandatory M/O	Description
ID	Inverter (Single Phase)	R	M	Include this model for single phase inverter monitoring
L		R	M	Model Length
A	Amps	R	M	AC Current
AphA	Amps PhaseA	R	M	Phase A Current
AphB	Amps PhaseB	R	O	Phase B Current
AphC	Amps PhaseC	R	O	Phase C Current
A_SF		R	M	
PPVphAB	Phase Voltage AB	R	O	Phase Voltage AB
PPVphBC	Phase Voltage BC	R	O	Phase Voltage BC
PPVphCA	Phase Voltage CA	R	O	Phase Voltage CA
PhVphA	Phase Voltage AN	R	M	Phase Voltage AN
PhVphB	Phase Voltage BN	R	O	Phase Voltage BN
PhVphC	Phase Voltage CN	R	O	Phase Voltage CN
V_SF		R	M	
W	Watts	R	M	AC Power
W_SF		R	M	
Hz	Hz	R	M	Line Frequency
Hz_SF		R	M	
VA	VA	R	O	AC Apparent Power
VA_SF		R	O	
VAr	VAr	R	O	AC Reactive Power
VAr_SF		R	O	
PF	PF	R	O	AC Power Factor
PF_SF		R	O	

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Service Requirement Manual - Figure 75D

DUKE ENERGY REQUIRES, FOR DER FACILITIES 250 KW AND LARGER, INSTALLATION OF TELEMETRY AND CONTROL EQUIPMENT IN ORDER TO MANAGE THE OPERATION OF DER ON DUKE ENERGY SYSTEM. REAL-TIME TELEMETRY OF CERTAIN DER ELECTRICAL VALUES AND ENABLE/ DISABLE CONTROL OF DER FACILITIES IS CRITICAL FOR REAL-TIME DISTRIBUTION MANAGEMENT SYSTEM OPERATING FUNCTIONS, AND IS ALSO CRITICAL FOR GENERATION/ TRANSMISSION AND BALANCING AUTHORITY OPERATIONS. USE OF THE ENABLE/ DISABLE CONTROL FUNCTION IS INTENDED FOR ATYPICAL SYSTEM OPERATING SITUATIONS ONLY.

FOR DER FACILITIES ≥ 250 KW AND <1 MW, SEE THE FOLLOWING TABLE FOR TELEMETRY & CONTROL REQUIREMENTS.

REQUESTED INTERCONNECTION VOLTAGE	TYPE OF FACILITY	REQUIREMENTS FOR TELEMETRY AND CONTROL
PRIMARY DISTRIBUTION VOLTAGE (>600V)	EXPORTING GENERATING FACILITY	DEFAULT: INTERCONNECTION RECLOSER (REFERENCE FIGURES 75C, 70B, 71B) OPTION: SMALL DG INTERCONNECTION INTERFACE (SEE NOTE 1)
PRIMARY DISTRIBUTION VOLTAGE (>600V)	NET METERING/ SELL EXCESS FACILITY	DEFAULT: SMALL DG INTERCONNECTION INTERFACE (SEE NOTE 1) OPTION: INTERCONNECTION RECLOSER OR OTHER SPECIAL DESIGN IF APPROPRIATE (SEE NOTE 2)
SECONDARY DISTRIBUTION VOLTAGE (≤ 600V)	EXPORTING GENERATING FACILITY	DEFAULT: SMALL DG INTERCONNECTION INTERFACE (SEE NOTE 1) OPTION: INTERCONNECTION RECLOSER (REFERENCE FIGURES 75C, 70B, 71B) OPTION: OTHER SPECIAL DESIGN IF APPROPRIATE (SEE NOTE 2)
SECONDARY DISTRIBUTION VOLTAGE (≤ 600V)	NET METERING/SELL EXCESS FACILITY	DEFAULT: SMALL DG INTERCONNECTION INTERFACE (SEE NOTE 1) OPTION: OTHER SPECIAL DESIGN IF APPROPRIATE (SEE NOTE 2)

NOTE 1: THE SMALL DG INTERCONNECTION INTERFACE CONSISTS OF A UTILITY-PROVIDED INTERFACE DEVICE AND CABINET WITH PRE-DESIGNED INTERCONNECTION WIRING TO SUPPORT THE INTERFACE TO THE CUSTOMER'S FACILITIES. THE CUSTOMER MUST PROVIDE DATA AND CONTROL CAPABILITY FOR THE GENERATOR TO THE DUKE ENERGY INTERFACE DEVICE. DUKE ENERGY WILL MAKE THE SMALL DG INTERCONNECTION INTERFACE DETAILS AVAILABLE UPON REQUEST OR AS NORMAL PART OF THE INTERCONNECTION REQUEST AND EVALUATION PROCESS, WHEN APPLICABLE.

DUKE ENERGY

Installation Issues

- Inverter Manufacturer promised firmware update would allow them to comply with Duke's Modbus Map. Not allow to update firmware to alter registers.
- Inverter Manufacturer did NOT have a Plant Controller solution. Developing as we go.
- Inverter Manufacturer provided correct Modbus list, but didn't specify that it was base 0, so all registers were offset by 1.
- Tremendous amount of time wasted having to reconfigure (29 registers x 13 inverters = 377 registers).
- Modbus Controls to limit power output did NOT work. A firmware update was applied to get inverters to allow for power limit. After firmware updates 3 of 13 inverters would still not allow power limit.
- Firmware update introduced 485 Modbus RTU latency of up to 15s on responses.
- Proprietary Modbus registers for controls.
- Reactive power setpoint capabilities required a NDA between Duke Energy and inverter manufacturer.

DUKE ENERGY

Duke Energy Pilot Site(s)

- Currently working to implement at net metered 3rd party site with 13 - 30kVA inverters. Total capacity of ~390kW.
- Duke owned distribution connected IPP site with 4 - 1500kVA inverters. Total capacity of ~6MW.
- Net metered 3rd party solar plus storage site. Total capacity of ~660kW.

Pilot sites were chosen to help understand the complexities of the multitude of DER setups.

DUKE ENERGY

How does this affect me?

DUKE ENERGY

House Bill 589 Section 2.(b)

PART II. COMPETITIVE PROCUREMENT OF RENEWABLE ENERGY

(b) Electric public utilities may jointly or individually implement the aggregate competitive procurement requirements set forth in subsection (a) of this section and may satisfy such requirements for the procurement of renewable energy capacity to be supplied by renewable energy facilities through any of the following: (i) renewable energy facilities to be acquired from third parties and subsequently owned and operated by the soliciting public utility or utilities; (ii) renewable energy facilities to be constructed, owned, and operated by the soliciting public utility or utilities subject to the limitations of subdivision (4) of this subsection; or (iii) the purchase of renewable energy, capacity, and environmental and renewable attributes from renewable energy facilities owned and operated by third parties that commit to allow the procuring public utility rights to dispatch, operate, and control the solicited renewable energy facilities in the same manner as the utility's own generating resources.

DUKE ENERGY

TSRG – Technical Standards Review Group
Wednesday May 6th, 2019

Selecting Voltages for the System Impact Study

Presented by Jonathan DeMay, PE

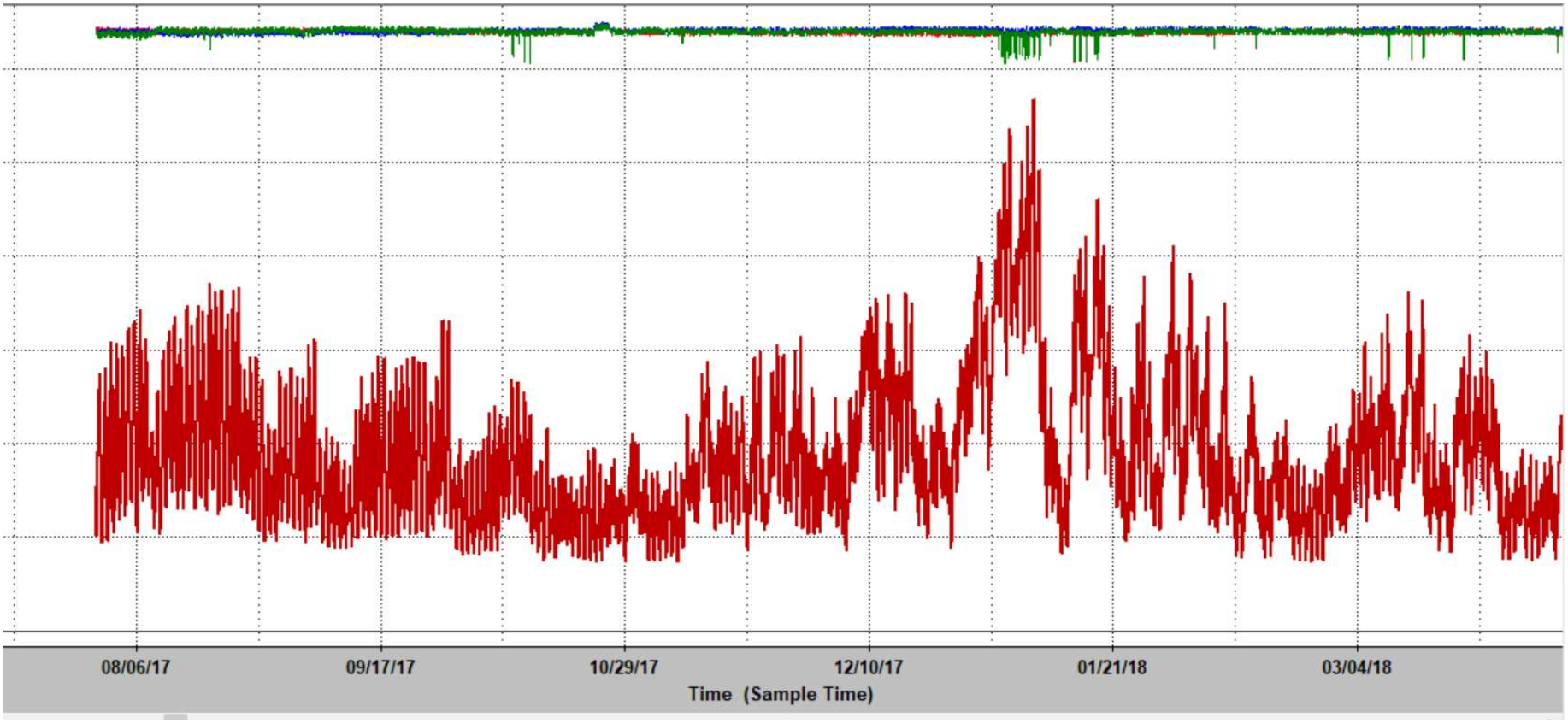
DUKE ENERGY®

BUILDING A SMARTER ENERGY FUTURE℠

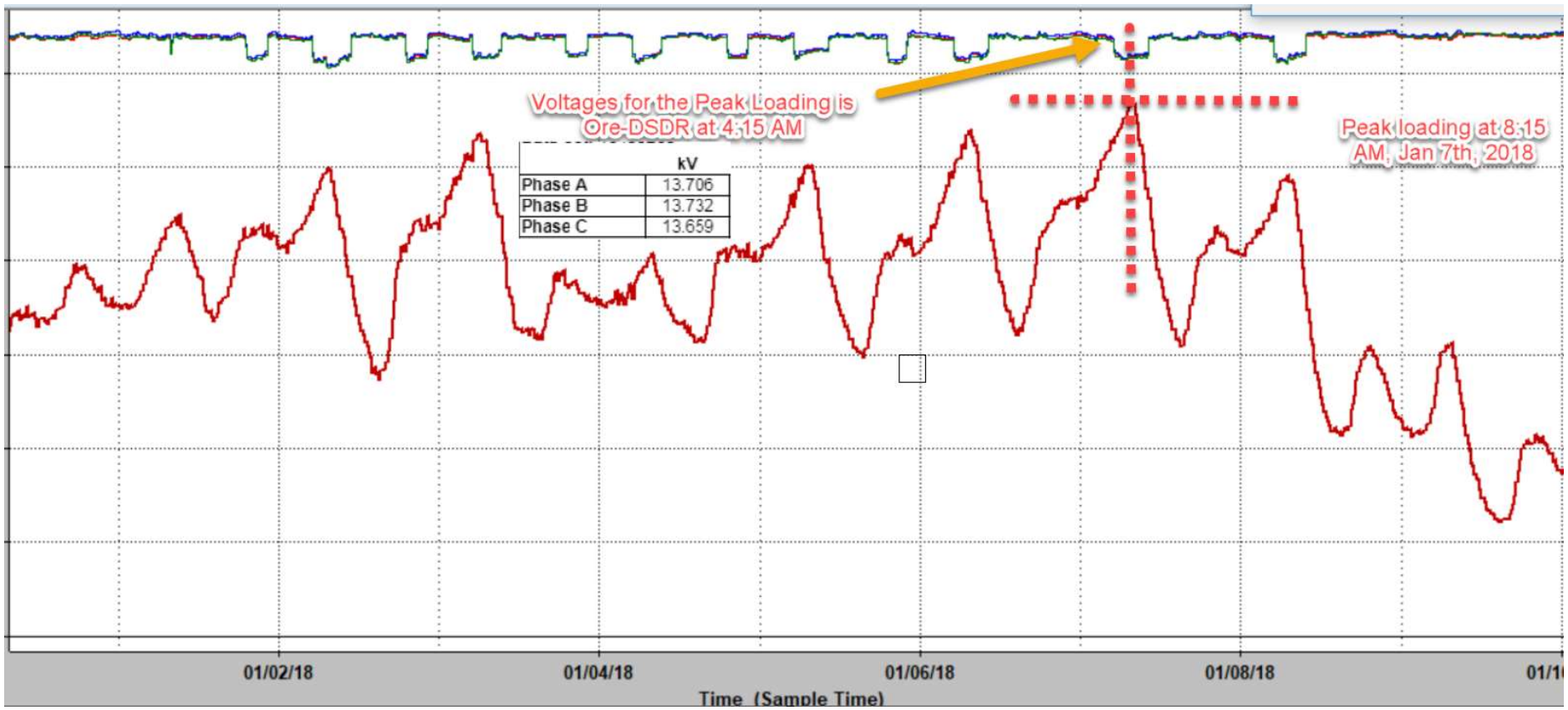
Introduction and Objectives

- Review the voltage and load selection methods
- Discussion/Questions

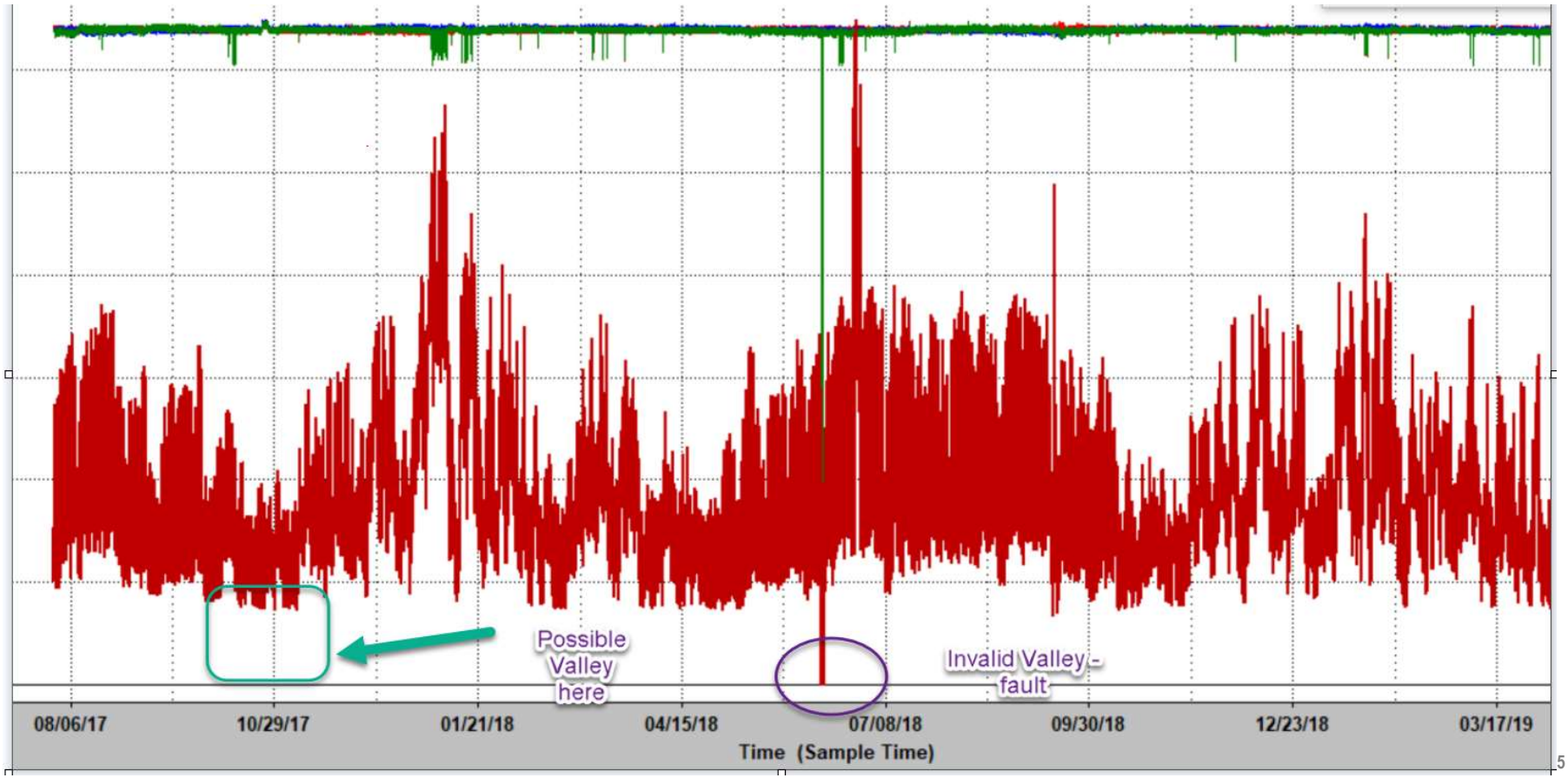
Voltage and Load Selection Method – Peak Loading Study



Voltage and Load Selection Method – Peak Loading Study



Voltage and Load Selection Method – Valley Demand



Voltage and Load Selection Method – Valley Demand